Comments on Management of Hazardous Waste in Research and/or Academic Laboratories.

Docket No. RCRA-2003-0012

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My comments are based on twelve years of being responsible for safe use and disposal of chemicals at a biological research institute for infectious diseases and toxins. The institute consists of three individual buildings on a military installation. There are a total of several hundred individual laboratories within the three buildings and between six and seven hundred employees half of which use hazardous chemicals on a daily basis. The individual laboratories vary in size from about ten feet by twelve feet to several that are about thirty feet by sixty feet. The majority of laboratories have three or four employees working in them with some of the larger laboratories having up to ten or twelve employees working in them. The work performed in each laboratory is independent of the research performed in all other laboratories but there are many common chemicals used in all areas and some wastes generated in all areas that are similar and in many other cases where not similar are compatible for consolidation.

In 1993 our institute was inspected by our state environmental regulatory agency. At that time the state environmental regulatory agency agreed with our waste handling structure and procedures. The laboratory was considered the point of waste generation. Waste collected at the point of generation was collected in containers of various sizes, with the largest container being 5-gallons in capacity, based on the estimated quantity to be generated per year. When a container collecting waste in a given laboratory was full or the process generating the waste was discontinued the container was moved to one of five satellite accumulation points. Each satellite accumulation point consisted of two storage cabinets, one flammable and one corrosive, centrally located in hallways and accumulated the waste for up to sixty laboratories. When sufficient quantities of waste were accumulated at the satellite accumulation areas, to make waste consolidation and lab packing for disposal economically feasible, the wastes were moved from the satellite accumulation point to our ninety-day storage area. Our state environmental regulatory agency agreed with this satellite accumulation system with the stipulation that the total quantity of waste in all the satellite accumulation points within a given building never exceeded 55 gallons of hazardous or 1 kilogram of acutely hazardous waste.

Our 90-day storage area consists of three storage rooms (toxic, flammable and corrosive) and one room that is used as a general work area. Chemicals from the satellite accumulation points were brought into the general work area room where they would remain for up to a month while necessary paperwork such as material safety data sheets

were obtained and the chemicals classified according to Environmental Protection Agency (EPA) and Department of Transportation (DOT) regulations. Once the chemicals in the work room had been classified and sorted according to EPA and DOT regulations a decision was made as to which chemicals within a given classification could be consolidated into one large container, usually a 5-gallon drum and which ones could not be consolidated but had to be lab packed. Containers in the workroom were not labeled with an accumulation start date. The accumulation start date was placed on the container that the chemicals were consolidated into or on the container holding the individual containers (lab pack) that were later to be packed by the hazardous waste hauler hired to transport the material for disposal. Once the chemicals were either consolidated or placed in lab pack containers and labeled they were placed in one of the three storage rooms by classification for disposal within the 90-day regulatory time frame.

In January of 2001 a representative of the EPA Regional Office responsible for our area inspected our facility. In June of 2002 we received a Notice of Violation based on that inspection. The delay in the issuance of the NOV was based on the fact that the EPA Region and the State Agencies within the region were trying to define acceptable limits for managing hazardous waste under the satellite accumulation rule which took longer than anticipated. I believe that this time delay while the EPA Regional Office and the State Agencies within the region were trying to define acceptable limits is a good indicator that the satellite accumulation issue has not been clear since the day it was written and is still not clear today. And even though I believe the outcome of the meetings will increase our disposal costs and increase the quantity of hazardous waste stored in laboratories within our facility I do applaud the attempt to standardize the interpretation so we are not at the mercy of the different interpretation that each inspector we encounter seems to have.

At a meeting with representatives of the EPA Regional Office and our State Environmental Office we were informed that the term “at or neat the point of generation” now means within the line of sight of the operator generating the waste. In our case that means that each of our several hundred laboratories is now a satellite accumulation point. Based on this we have changed the signs on the cabinets previously use for all waste collection from satellite accumulation to “excess hazardous material”. Along with the sign change we instituted a policy that only material that has not been used in a process may be put into the cabinets. That covers all excess chemicals that a researcher wants to get rid of. Placing these “unused” chemicals into the cabinets is acceptable based on the fact that we can claim that the chemicals may be used in other laboratories and the fact that technically the chemicals are owned by the Department of Defense and the Defense Reutilization and Marketing Organization is the one responsible for determining whether the individual chemicals have resale value and therefore are the ones that determine whether or not the material is “waste”.

Used chemicals, or “spent” as the regulation states, are a different issue. It is pretty hard to justify a statement that a chemical used in a procedure in a biological research laboratory will have some beneficial use somewhere else inside or outside of the facility.

Currently these materials must remain in the laboratory under the control of the operator who generated them. That in itself creates a major problem. If I have four personnel in a laboratory and each one generates hazardous waste do I have to have four satellite accumulation areas within that one laboratory? Each individual may generate a different classification of waste or they may each generate the exact same waste or they each may generate different waste of the same classification, which are compatible. Do these individuals have to have individual containers or can they share one container for waste that is the same or compatible? At the meeting we had with the regulatory representatives it was suggested that maybe the head of the research project could be considered the "operator". That would be comparable to making the director of the facility the "operator". The head of a research project directs the activities but in many instances never enters the laboratory where a particular aspect of his/her total project occurs. The head of the facility directs all the operations but may never enter any of the laboratories. It also is no different that assigning responsibility for the satellite accumulation cabinets in the hallways to the person responsible for maintaining the 90-day storage area which is what the state inspectors had allowed.

Earlier this year a new environmental manager was hired for our military installation. In an attempt to understand the situation with laboratories he contacted our State Environmental Office to get a more definitive answer to the question of who is considered the "operator" for waste generated in a given laboratory. The answer he was given was that someone would have to come out and review the work being performed in a given laboratory before such a determination could be made. It could be one individual or it could be each individual separately based on what procedures were performed in the laboratory. I believe this response indicates that for this issue we are still at the mercy of the interpretation of every inspector who performs an inspection and that different interpretations may be applied to individual laboratories within a building.

Currently we do consider each laboratory a satellite accumulation point. The question of whether each employee is responsible for the waste they generate as the "operator" is unanswered. Excess chemicals are placed in the cabinets that were previously labeled as satellite accumulation points and used hazardous waste is picked up from the laboratory and taken directly to the workroom in the 90-day storage area. As soon as the containers reach the workroom they are labeled with an accumulation start date.

The main problem with these changes is that it makes it extremely difficult to consolidate compatible materials for disposal and to create lab packs due to the small quantities of excess and waste material that the laboratories generate. In our situation we try to consolidate waste in 5-gallon containers. The majority of the RCRA waste that is consolidated is flammables. If I have to get rid of a 1-gallon container of flammable liquid that is just a characteristic listed waste (D001) I have to pay $2.06 per pound. If I can consolidate the material in a 5-gallon drum the cost of disposal drops to $0.31 per pound. Assume the liquid weighs 8 pounds per gallon. The cost of disposal for one gallon is $20.60. That is $16.48 for the liquid and $4.12 for the glass container which weighs an average of 1-¾ pounds (all weights are rounded up to the nearest pound). If I can accumulate until I have five gallons of flammable liquid the cost is approximately

$21.00 and that price includes the weight and cost of the 5-gallon plastic container. In summary, combining flammable liquids into a 5-gallon container from 1-gallon glass containers represents a savings of over $80.00. The savings are even greater when I can combine numerous smaller containers into the 5-gallon container.

We have several researchers who generate 1-2 gallons of synthesizer waste each month. In most cases it is not possible to combine the waste from two different synthesis processes due to incompatibilities between the many individual chemicals in each process. Since space is at a premium in all of our laboratories and we no longer can put spent waste in centrally located areas (satellite accumulation points) researchers now turn these containers in on a monthly basis. The containers are taken directly from the lab to the 90-day storage area. To be in full compliance the containers of spent waste are labeled with an accumulation start date that is the day they enter the workroom in the 90-day area. Within the 90-day period enough of the individual wastes may be accumulated to consolidate into a 5-gallon drum. However, when the material is consolidated into the 5-gallon drum the question as to what the accumulation start date on the 5-gallon drum should be needs to be answered. According to the regulation I have 90 days to dispose of the 1 or 2 gallons that first came into the 90-day workroom. Based on this I assume the accumulation date on the 5-gallon container should be the same date as the accumulation start date on the oldest container combined into the 5-gallon container. If I assign a new accumulation start date on the 5-gallon container using the date the material was combined I in essence have done satellite accumulation in my workroom.

Based on the paperwork and disposal process that we have to go through to dispose of hazardous waste even the scenario above is hard to accomplish. All paperwork has to be completed at least 30 – 40 days prior to scheduling a hazardous waste pick-up. At that point in time I have to make a determination as to whether or not to combine what I have or dispose of the containers individually. (My price break is based on the size of the container not whether or not the container is full. I sometimes may save money by consolidating less than 5-gallons into a 5-gallon container.) My point here is that I do not have 90 days in which to consolidate and combine material. I have 90 days in which to get rid of material and at least a third or more of that time is consumed in processing the necessary paperwork for disposal.

It was suggested that I investigated whether or not our institute qualifies as a conditionally exempt small quantity generator and the answer is no. We have a very active pathology department that generates 20 to 25 gallons of ethanol/xyless monthly which in combination with the other small quantities generated puts us above the 100 Kg monthly limit.

Our institute does fall between the 100 Kg and 1000 Kg monthly limit that would entitle us to 180 days for waste accumulation time. However, our generator identification is for the entire military installation we are located on. Our installation Hazardous Material Management Office is currently investigating whether the current RCRA regulated waste generated on the installation falls into this range. If the installation generates more than

1000 Kg a month then we will investigate the possibility of obtaining a separate generator identification number for our institute.

In an attempt to seek aid in the resolution to the situation above I contacted the EPA Office of Solid Waste and was invited to the Public Stakeholder Meeting on Hazardous Waste Management in Laboratories on June 18th. The following are my comments on some of the points discussed during this meeting and the effect I believe they could have on improving our disposal process.

Hazardous Waste Determination, Labeling and Training

The question as to whether or not classifying material for disposal should be performed by the individual generating the waste or an individual specifically trained for the task is irrelevant to the bigger issue of who determines what is a waste and when does it becomes a waste. In very small laboratories it may be necessary for each individual to know how to classify the wastes they generate for disposal or the task could be contracted out to the firm performing their disposal. In many large laboratories it is a necessity to have an individual specifically trained and responsible for this task. In simple terms it is just a functional decision.

The question of who determines whether a material is a waste or when a material becomes a waste is the key to all of my concerns. If the determination that a material is a waste is made in the individual laboratories then accumulation is extremely difficult due to the accumulation point being restricted to each individual laboratory where the chemical is used. On the other hand if I make the determination at the workroom in my 90-day storage area then there can be a smooth flow of material with consolidation and lab packing made simple. Suppose someone turns in three 1-gallon containers of unused acetone. When I get them into my storage area workroom I decide that they cannot be used anywhere else and call them waste. Since I made the decision that they are waste I am technically the generator of the waste. Being the generator of the waste then I can accumulate them in my workroom until I have up to 55- gallons of hazardous waste in my workroom. And I would be the one responsible for the accumulation area since the area is under my control at all times. Given that I am only looking to consolidate 5-gallons at a time I will never reach the 55-gallon limit in my workroom. And since they are in a satellite accumulation area the is no requirement for me to put any additional labels on the containers other than that already required by OSHA.

If I can make the determination as to whether or not used material is a waste then the same thing applies, the workroom becomes my satellite accumulation point for this material also. In fact the accumulation areas that I had used previously would now become acceptable again. They would still be used for storage of hazardous materials since the determination as to whether or not the materials they contain are wastes will not be made until they are removed to the workroom in the 90-day area regardless of whether or not the material has been used.

I know that some people have concerns about keeping hazardous waste in unlocked storage cabinets for safety and security reasons. I personally see no difference between storing unused and used chemicals in the same manner. In other words why is perfectly acceptable for me to store three gallons of unused acetone in a cabinet in a hallway but not acceptable to place 30 milliliters of used acetone in a similar cabinet in the same hallway? As far as I know there is no chemical basis for assuming that for some reason the 30- milliliters is more dangerous since it has been used.

When I use the term if I am allowed to make the determination as to when a material is a waste I of course am implying that my decision is based on a formal policy established by the institute that I work for. Currently we have incorporated into our Occupational Safety and Health Administration (OSHA) mandated Chemical Hygiene Plan acceptable shelf life for chemicals. We also have a separate regulation covering the disposal of all chemicals hazardous or not.

If there is a concern that laboratories are not getting rid of waste in a timely manner I think the EPA could follow the lead of OSHA and set up a performance-oriented regulation for laboratories. The regulation could require each institute to initiate and carry out the provisions of a plan to ensure the efficient, timely and safe disposal of all chemical waste within an institution. The plan could even include a shelf life policy for chemicals. When our researchers realized that any container of chemical that they purchase will have to be disposed of in five years, with exception requiring special approval, the size and quantity of containers they purchase at any one time drastically reduced.

In conclusion let me sum up what I am trying to say in an analogy similar to one that has become well known since the RCRA regulations were written, that is the “cradle to grave” concept for hazardous waste. I believe it is becoming unclear where the “cradle” is when dealing with laboratories. If the decision that the determination of hazardous waste is made in the laboratory, which the line of sight determination for satellite accumulation indicates has been made, I believe the new concept will have to be called “womb to grave” and this invasion of the womb by outsiders will cause many premature births. Even though I believe “cradle to grave” tracking was originally an analogy for the manifest system that tracks waste from pick-up at a facility to final disposal I propose that cradle be moved no closer to the generating point than the 90-day storage area for laboratories since that is where the actual clock for disposal begins.

I would like to make it perfectly clear that I am not proposing that the waste determination be made in the 90-day storage area but in a work room or area that is classified somewhere between the laboratory where the chemicals originated and the 90-day area where the accumulation start date begins. This work area may be part of the 90-day area or in an entirely separate area.

Satellite Accumulation Time

It turned out that this issue addressed the time frame for handling the quantity of waste in a satellite accumulation area that is over the 55-gallon limit. Obviously since we are trying to find a way to accumulate 5-gallons of waste for consolidation this issue has no meaning for us.

Treatment Performed in Laboratories

We perform no treatment on RCRA regulated materials and have no desire to. In almost all cases it is cheaper for us to dispose of our wastes through a hazardous waste firm than to perform treatment. At the meeting the issue of treating both botulinum toxin and ethidium bromide were mentioned. Neither is RCRA regulated and therefore treatment is allowed. We normally neutralize our botulinum toxin with bleach and ethidium bromide we dispose of through our hazardous waste contractor since it is cheaper than any other method including treatment. Which brings up a positive point about how laboratories currently handle hazardous waste. Of the hazardous waste that we dispose of (excluding the large quantity of xyless II/ethanol we generate) approximately 25% is RCRA regulated. I believe that more than 50% of the hazardous waste disposed of by most laboratories is not RCRA regulated. This waste includes mutagens, carcinogens, toxins, toxics and solid corrosives. This shows that laboratories are conscientious about how they dispose of hazardous materials to protect the environment. I see the main conflict between laboratories and regulatory agencies not as what should be classified as hazardous but what disposal procedure provides the best functional and economic benefit.

In Conclusion

It was stated at the meeting that the EPA has not decided whether they are going to deal with this issue with a directive or a change in the regulation. I personally feel that a change in the regulation is the most appropriate way to go. The current regulation is very vague and there is too much room for individual interpretation. I truly believe that when a regulation is this vague the regulated community is penalized. The states must have regulations that are at least as stringent as those of EPA. When the EPA regulation leaves much room for interpretation the only thing the states can do to ensure that they are at least as stringent is to become even more stringent to meet the worst case scenario. I believe the original intent of the EPA was to leave room for interpretation to adapt to the variety of facilities that generate hazardous waste and over time this room for interpretation has gone in the opposite direction and has caused regions and states to become more stringent and force generators to fit into the regulation rather than the regulations be fit into the generators needs and processes. In the case of satellite accumulation the situation is even more complicated by the fact that the Office of Solid Waste usually defers to the interpretation of the various regions and the interpretations of the states under the various regions must now be more stringent that the interpretations of the regions.

Thank you for the opportunity to express my views and participate in this discussion process.